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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,552	10/26/2001	Bowie G. Keefer	6454-56838	1313

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EXAMINER	
MEDINA SANABRIA, MARIBEL	
ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 10/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/039,552	KEEFER ET AL.	
	Examiner	Art Unit	
	Maribel Medina	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43 and 87-136* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *118-123* is/are allowed.

6)☒ Claim(s) *1-20,23-43,88,91-100,106-108,110-114,117,124,125 and 135* is/are rejected.

7)☒ Claim(s) *21, 22, 87, 89, 90,101-105,109,115,116,126-134 and 136* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 May 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/16/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The lined-through references on the IDS filed on 7/16/2004 were previously considered by the Examiner (See the IDS filed on 1/14/04; 3/11/02; and 3/21/02).

Response to Arguments

2. Applicant's arguments with respect to claims 1-43, 64-73 and 77-86 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 7, 8, 13, 15, 18, 19, 20, 23, 27, 31, 32, 34, 35, 37, 39, 91, 93, 94 and 135 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 10027621 A (Koga).

Koga discloses a process for providing a hydrogen-containing gas stream to a fuel cell anode (16), comprising: introducing a hydrogen-containing gas stream (3) that includes at least one contaminant (i.e. carbon monoxide) into a gas separator module comprising a carbon monoxide pressure swing adsorption (CO-PSA) unit (14); a shift converter (17a) and a selective oxidation reactor (17b) to produce a purified hydrogen-containing gas stream; and introducing

the purified hydrogen-containing gas stream to the fuel cell anode. The fuel cell can be any of phosphoric acid, solid polymer or solid electrolyte-type fuel cell and the hydrogen-containing gas is generated in reformer (12) (See paragraphs 13-18 and Figure 3). No difference is seen between the instantly claimed invention and Koga's disclosure.

5. Claims 106, 107, 108, and 110 are rejected under 35 U.S.C. 102(b) as being as being anticipated by JP 6334862 (Matsumoto et al.).

Matsumoto et al disclose a process for providing a hydrogen-containing gas stream to a fuel cell, comprising: providing a fuel cell (5) defining a coolant passage and an anode inlet (6) for receiving a hydrogen-containing gas stream (12); mixing liquid water and a hydrocarbon fuel stream resulting in a coolant mixture (17); introducing the coolant mixture in the coolant passage of the fuel cell; vaporizing the coolant mixture to form a steam /fuel vapor mixture (18); subjecting the steam/fuel vapor mixture (18) to reaction conditions sufficient for generating a hydrogen-containing gas stream(12) by steam reforming; purifying the reformed gas stream by water gas transformation; and introducing the hydrogen-containing gas stream into the fuel cell anode inlet (6) (See Figures 1 and 2 and the abstract). No difference is seen between the instantly claimed invention and Matsumoto et al disclosure.

6. Claims 106, 108, 110, 111, 124 and 125 are rejected under 35 U.S.C. 102(b) as being as being anticipated by US Patent No. 4, 994,331 (Cohen).

Cohen discloses a process and system for providing a hydrogen-containing gas stream to a fuel cell, comprising: providing a fuel cell (9) defining an evaporative cooler (5) and an anode for receiving a hydrogen-containing gas stream; mixing liquid water (Separated from Contact cooler 12) and a hydrocarbon fuel stream (4) resulting in a coolant mixture; introducing the

coolant mixture in the evaporative cooler of the fuel cell; vaporizing the coolant mixture to form a steam /fuel vapor mixture; subjecting the steam/fuel vapor mixture to reaction conditions sufficient for generating a hydrogen-containing gas stream (12) by steam reforming in reformer (7); purifying the reformed gas stream by water gas shift (8); and introducing the hydrogen-containing gas stream into the fuel cell anode inlet (See Figure 1 and col. 1, line 55 to col. 2, line 64).

The fuel Cell (5) further comprises a cathode outlet for discharging a cathode exhaust gas stream that includes cathode water vapor. A portion of the cathode exhaust gases is introduced into the contact cooler (12) wherein a portion of the cathode water vapor is condensed. No difference is seen between the instantly claimed invention and Cohen's disclosure.

7. Claims 1, 2, 7, 8, 13, 14, 15, 16, 17, 18, 19, 24, 31, 32, 34, 35, 37, 93, 94, 95, and 135 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 63228572 A (Nakaoka et al).

Nakaoka et al disclose a process and system for producing a hydrogen-containing gas by the steam reforming of methanol. The hydrogen-containing gas produced is purified by contacting it with a moisture adsorbent (8) and a carbon monoxide adsorbent (9) and thereafter introduced to a fuel cell (See Abstract). No difference is seen between the instantly claimed invention and Nakaoka et al disclosure.

8. Claims 1, 2, 8, 10, 13, 15, 16, 17, 18, 24, 27, 31, 32, 34, 35, 37, 91, 93, 94, 95, and 135 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 04206161 A (Yanagi).

Yanagi discloses a process and system for producing a hydrogen-containing gas by the steam reforming of methanol. The hydrogen-containing gas produced is purified by contacting it

with a carbon dioxide adsorbent and a carbon monoxide adsorbent; and thereafter introduced to a fuel cell (See Abstract). No difference is seen between the instantly claimed invention and Yangi's disclosure.

9. Claim 29 is rejected under 35 U.S.C. 102(b) as being anticipated by WO 99/19249 (De Jong et al).

De Jong et al disclose a process for proving a hydrogen-containing gas stream to a fuel cell comprising: providing a mixture of an oxygen-enriched gas stream and a fuel in a partial oxidation reactor to produce a hydrogen-containing gas stream that includes carbon monoxide contaminant; separating the carbon monoxide contaminant from the hydrogen-containing gas stream; and introducing the resulting purified hydrogen-containing gas stream into a fuel cell (See page 3, lines 23-27; page 6, line 10; and page 9, lines 23 to 36). No difference is seen between the instantly claimed invention and De Jong et al disclosure.

10. Claims 1-20, 23, 25, 27, 29, 30-38, 40-42, 88, 91, 93-97, 99, 100, 112-114, and 117 are rejected under 35 U.S.C. 102(e) as being anticipated by US 2002/0004157 A1 (Keefer et al)

The applied reference has a common assignee and two common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Keefer et al disclose the instantly claimed process and system. Keefer et al disclose a process for providing a hydrogen-containing gas stream, produced by one of autothermal, reforming, steam reforming and POX, to a at least one fuel cell anode, comprising: Introducing a hydrogen-containing gas that contains at least one contaminant (i.e. carbon monoxide, carbon dioxide, ammonia, among other impurities (see [0130], [0190])) to a water gas shift reactor and a to a rotary PSA containing rotating absorbers (see [0092]) to produce a purified hydrogen-containing stream and feeding said stream to the anode of a fuel cell. Keefer et al further disclose the use of an oxygen-PSA to produce an oxygen-enriched gas stream and disclose feeding and using the tail gas from the PSA units as fuel gas for a combustion turbine to power the PSA compression machinery (See [0089]). No difference is seen between the instantly claimed invention and Keefer et al disclosure.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 3, 4, 9, 28, 38, 43, 88, and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koga as applied to claims 1, 2, 7, 8, 13, 15, 18, 19, 20, 23, 27, 31, 32, 34, 35, 37, 39, 91, 93, and 94 above, and further in view of US Patent No. 4,743,276 (Nishida et al).

Koga applies herein as above. Koga discloses the instantly claimed invention and the use of a CO-PSA separation unit to remove carbon monoxide from the hydrogen-containing gas

stream. However, is silent in regards to: the specific adsorbent material used in his process, and the temperature at which the hydrogen-containing gas is introduced into the CO-PSA.

Nishida et al is relied upon to teach the use of Cu- and Ag-containing materials for the adsorption of carbon monoxide from gas streams and discloses effective temperatures of adsorption in the range form 50 to 250°C.

It would have been obvious to one with ordinary skill in he art to have used a Cu- or Ag-containing material as the CO adsorbent material in Koga's CO-PSA, since Koga discloses that any known CO adsorbent can be used in his process (See [0015]) and since Nishida et al discloses that these are well known and recognized CO adsorbent materials.

Regarding the temperature, it would have been obvious to one with ordinary skill in he art to have introduced the hydrogen-containing gas stream into the CO-PSA unit having either Cu- or Ag-containing material as the adsorbent in Koga's process at temperatures in the range from 80°C to 200°C, since Nishida et al disclose that temperatures in the instantly claimed range are effective for the adsorption of the CO in the instantly claimed materials.

13. Claims 112 and 117 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 751045 (Abersfelder et al) in view of Koga. The following rejection (over Aberfelder et al) is referred to the English Equivalent document US Patent Application 6,210,822 B1.

Abersfelder et al disclose an electrical current generating system comprising: at least one hydrogen gas separation module (11) that includes a first outlet for discharging a purified hydrogen gas (14) and a second outlet for discharging a separation exhaust gas (15); at least one fuel cell defining an anode inlet (8) that fluidly communicates with the first outlet (14) of the hydrogen gas separation module; and a combustion engine (1) defining a fuel inlet (19) that

fluidly communicates with the second outlet (15) of the hydrogen separation module (11) (See Figure). The fuel cell is a polymer electrolyte membrane (See col.1, lines 55-67).

Abersfelder et al disclose the claimed system; however fail to disclose that the hydrogen separation module comprises a pressure swing adsorption module.

Koga discloses the use of pressure swing adsorption module for separating contaminants from hydrogen-containing gases.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a pressure swing adsorption (PSA) module as a hydrogen separation module in Abersfelder et al system, since Koga discloses that PSA are well known and recognized hydrogen separating devices, and since Aberfelder et al disclose that any known prior art hydrogen separating device can be used in his process (See col. 2 , lines 38-43).

14. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over De Jong et al as applied to claim 29 above, and further in view of US Patent no. 5,245,110 (Van Dijk et al).

De Jong et al apply herein as above. De Jong et al disclose the use of enriched oxygen in the partial oxidation of a fuel, however is silent on how the enriched oxygen is obtained.

Van Dijk et al is relied upon to teach the use of pressure swing adsorption to produce oxygen enriched gas streams from air (See col. 7, lines 5-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the oxygen-enrichment pressure swing adsorption method, of Van Dijk et al in De Jong et al process, since this is a known and common method for obtaining oxygen-enriched gas streams.

15. Claims 3, 4, 9, 28, 38, 43, 88, and 92 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakaoka et al as applied to claims 1, 2, 7, 8, 13, 14, 15, 16, 17, 18, 19, 24, 31, 32, 34, 35, 37, 93, 94, 95, and 135 above, and further in view of US Patent No. 4,743,276 (Nishida et al).

Nakaoka et al apply herein as above. Nakaoka et al disclose the instantly claimed invention and the use of an adsorbent to remove carbon monoxide from the hydrogen-containing gas stream. However, is silent in regards to the specific adsorbent material used in his process, and the temperature at which the hydrogen-containing gas is introduced into the absorber.

Nishida et al is relied upon to teach the use of Cu- and Ag-containing materials for the adsorption of carbon monoxide from gas streams and discloses effective temperatures of adsorption in the range form 50 to 250°C.

It would have been obvious to one with ordinary skill in he art to have used a Cu- or Ag-containing material as the CO adsorbent material in Nakaoka et al CO adsorbent, since Nishida et al disclose that these are well known and recognized CO adsorbent materials.

Regarding the temperature, it would have been obvious to one with ordinary skill in he art to have introduced the hydrogen-containing gas stream into the Cu- or Ag-containing adsorbent in Nakaoka et al process at temperatures in the range from 80°C to 200°C, since Nishida et al discloses that temperatures in the instantly claimed range are effective for the adsorption of the CO in the instantly claimed materials.

16. Claims 3, 4, 26, 28, 43, 98, and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Keefer et al as applied to claims 1-20, 23, 25, 27, 29, 30-38, 40-42, 88, 91, 93-

97, 99, 100, 112-114, and 117 above, and further in view of US Patent No. 4,743,276 (Nishida et al).

Keefer et al apply herein as above. Keefer et al disclose the instantly claimed invention and the use of a CO-PSA separation unit to remove carbon monoxide from the hydrogen-containing gas stream. However, is silent in regards to the use a Cu- or Ag-containing material as the CO adsorbent material.

Nishida et al is relied upon to teach the use of Cu- and Ag-containing materials for the adsorption of carbon monoxide from gas streams and discloses effective temperatures of adsorption in the range form 50 to 250°C.

It would have been obvious to one with ordinary skill in he art to have used a Cu- or Ag-containing material as the CO adsorbent material in Keefer et al CO-PSA, since Keefer et al discloses that any known CO adsorbent can be used in his process (See [0089]) and since Nishida et al disclose that these are well known and recognized CO adsorbent materials.

Allowable Subject Matter

17. Claims 21, 22, 87, 89, 90, 101-105, 109, 115, 116, 126-134, and 136 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

18. The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 21, the prior art fails to disclose preferentially separating water vapor in the first separation zone, preferentially separating carbon dioxide in the second separation zone; and preferentially separating carbon monoxide in a third separation zone. Regarding claims 21 and

87, the prior art fails to disclose or suggest that the first separation zone comprises a desiccant and that the second and third separations zones comprises a zeolite. Regarding claims 89 and 90, the prior art fails to disclose or suggest that the reformer or partial oxidation reactor comprises first and second burners. Regarding claims 11 the prior art fails to disclose the step of further mixing a portion of the purified hydrogen gas stream with the separation exhaust gas stream as a fuel for the combustion engine. Regarding claims 102 –103, the prior art fails to disclose or suggest cooling the combustion engine with the water from the cathode exhaust gas stream. Regarding claim 104, the prior art fails to disclose or suggest that the combustion engine produces an engine exhaust gas stream and the process further comprising heating a hydrogen gas generating system with the engine exhaust gas stream. Regarding claim 105, the prior art fails to disclose or suggest the process further comprising: mixing liquid water and a hydrocarbon fuel stream resulting in a coolant mixture introducing the coolant mixture into a coolant jacket juxtaposed with the combustion engine; vaporizing the coolant mixture to form a steam/fuel vapor mixture; subjecting the steam/fuel vapor mixture to reaction conditions sufficient for generating a hydrogen-containing gas stream; and introducing the hydrogen-containing gas stream into the second pressure swing adsorption module. Regarding claim 109, the prior art fails to disclose purifying the hydrogen-containing gas via pressure swing adsorption. Regarding claim 115 and 116 the prior art fails to disclose that the combustion engine comprises a cooling jacket. Regarding claims 118-123, the prior art fails to disclose or suggest a pressure swing adsorption module positioned between the hydrogen generating module and the fuel cell anode inlet. Regarding claims 126-134 and 136 the prior art fails to disclose that the CO adsorbent comprises a carbon fiber paper or a carbon cloth.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maribel Medina whose telephone number is (571) 272-1355. The examiner can normally be reached on Monday through Friday from 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Maribel Medina
Examiner
Art Unit 1754